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A UNIVERSAL LAW OF ECONOMIC VARIATION.

ONE law governs economic life, and theories old and new contain partial expressions of it. The theory of value rests on one fragment of the general law, and the theory of rent on another. It acts in consumption, and makes the "final increment" of a particular article less useful than earlier increments. It acts also in production, and makes the final increment of an industrial agent less fruitful than earlier ones. Value depends on final utility; and shares in distribution depend on final productivity. Interest is fixed by the product of the final increment of capital, and wages are determined by the product of the final increment of labor. The value of goods, on the one hand, and the incomes of the men also make the goods, on the other, depend on the same general law.

Classical theories recognized so much of the action of this law in production as was involved in the study of diminishing returns from land under tillage. The theory of rent is based on this partial application of a comprehensive principle. A fuller application is needed. Labor, as

applied in successive increments, not to land only, but to productive wealth in all its forms, yields diminishing returns; and so does capital, as it is used in enlarging quantities by a fixed working force. There are other diminishing returns and other surpluses to be studied than those afforded by agricultural land. All through the operation of production are to be seen the effects of a law of lessening returns, and the fact of surpluses akin to rent.

Opposite in kind are consumption and production. Nature spends itself on man in the one process, and man spends himself on nature in the other. One and the same is the law that governs the results realized in the two cases. It may be called a law of variation of economic results; and, if it were stated in its entirety, it would give unexpected unity and completeness to the science of Economics. It would explain at the same time both value and distribution.

Consumption is a process that yields subjective returns. They are measured in the sensibilities of men, and are the ultimate objects of the production itself. The immediate objects of production are the material things that affect the consumer's sensibilities. These things are objective. Man acting on man through matter,—such is the whole economic process. How much can be gained by the whole of it? is the practical question to be answered. The gain depends on the benefit that a product will afford to a man when he gets it, and also on the number of products which he can get. This is saying that it depends on the utility of the goods, and on the productivity of the agents that create them. It depends on the two variations that are governed by this law.

Final utility itself has been studied in a too limited way. In the case that is usually cited, one commodity is taken, and, in imagination, is given in increasing quantity to one consumer. The successive units of it then do less and less for him. Bread given to a man in a succession of

slices nourishes, pleases, and ultimately gluts him. If he must eat it, the n^{th} slice is worth nothing to him, and the following ones less than nothing. Coats of one kind bestowed on a man one after another would soon lose their power to benefit him. The fourth might be of so little use that a tramp might have it for the asking. Duplicate copies of the same book or of the same picture would encumber the shelves and the walls; and their room would be better than their presence. Very abrupt is the descent of the "utility curve" that, in graphic representation, expresses the lessening service that successive units of things of exactly the same kind are capable of rendering. Vary the articles in kind, and you have a different result. Change the weight, the color, and the cut of the successive coats, and the man will be glad to have more than five of them. Give him books that differ from each other, and he may strain the storage capacity of his house to accommodate them. By changing the quality of the articles offered you appeal to different wants; and, as long as there are in man's sentient nature wants still to be satisfied, there is no reason why he should stop accepting what you offer. If two coats are alike in all respects but weight, the thicker garment satisfies just one want that is not satisfied by the other. It will be purchased, perhaps, for the sake of that single utility. Clothing in general, not confined to garments of any kind, shows a gradually descending utility curve. Food in general diminishes in utility far less abruptly than does bread. Duplicate nothing: add to potatoes bread, then meat, pastry, fruit, and the refined products of the French cuisine, and you will find the diminution of the utility of successive increments far less rapid than is the diminution of the utility of any one thing. Where we vary the quality of the second increment of an article offered to a consumer, we virtually offer to him a different article. We render to him a new and distinct service.

It is probably true that the theory of value has not taken due account of the abrupt decline in the utility of one article when successive units of it, wholly unchanged in quality, are offered to one consumer. The gently descending utility curves that graphic representations usually present tell what is true of a genus of articles rather than of a single one. They tell, also, what may be true of a raw material that is capable of being put into many kinds of finished goods. Oak lumber offered for sale foot after foot may have a utility that diminishes quite gradually. It can be wrought into tables, chairs, mantles, bookcases, doors, etc. If its use were confined to the making of dining tables of one pattern, the utility of the lumber itself would soon be slight. Raw materials, however, are not consumers' goods, and should not figure at all in this part of the study. They have productivity, but none of the utility of which we are now speaking.

A correction needs to be made in the theory of value by reason of the vague way in which the successive increments of an article, presumably of one kind, are in reality conceived. This is not the only correction that is here to be made. We have undertaken to generalize the law that is at the basis of the theory of value. In reality, it is all-comprehensive. The first generalization to be made consists in applying the law not to single articles, but to consumers' wealth in all its forms. Give to a man not coats, but "dollars," one after another, and the utility of the last will be less than that of any other. A dollar means command of a quantity of consumers' wealth indeterminate in its form. Wealth as such loses its specific utility if you give it, unit after unit, to a single consumer. To apply the law of diminishing utility to a raw material, or to a genus of consumers' goods, such as food, under the impression that one is applying it to a single article of consumers' wealth, is unintelligent; but to apply it, for a purpose, to the largest genus of unsalable goods that can

be made,—that is, to consumers' wealth in general,—is to take a scientific step in advance. The more wealth a man has for personal use, the less is its specific value to him. Its usefulness per unit is diminished.

Offer, for a day's consumption, not bread only, but a miscellany of articles for food, and a larger miscellany of articles for the promotion of health and enjoyment, and you offer a day's stipend of general wealth. It may be presented in increments; but each of these will be a composite of many things. For a reason that will appear the later increments of general wealth consumed by one person are more varied in their composition than the earlier ones. They contain more elements. Very many and very diverse are the articles that constitute the last increment of general wealth that a consumer devotes to his personal use.

Let us take, for example, the consumption of a year, and see what it includes. An article or two for food may constitute the first or most necessary element in it. Plain clothing may constitute the second. Rude shelter, an improvement in the food, and some fuel for heat and light may compose the third. Every later element will include qualitative changes in the articles already possessed. The man wants not only more things, but better ones. He improves and diversifies the material that he uses, and the later increments of his year's stipend of consumers' wealth take on a very heterogeneous character.

Now, the law of diminishing subjective returns applies not only to single articles, but to these composite increments of general wealth. The man would express the fact by saying that the dollars became worth less and less to him as he gets more and more money to spend. With the first hundred dollars he buys a few very necessary things, and with the last some new things and many qualitative changes in the old ones. What the last sum of a hundred dollars does for him in all these ways is relatively little.

The composition of the several increments of wealth consumed is of scientific importance. In the statements that are now current it is said that the final increments of different commodities purchased for consumption at the same cost are, with certain allowances, of the same utility to the purchaser. With the last hundred dollars of the year's income the man in the illustration will buy some particular things that he did not have before, and he will add quantitatively to his supply of things of which he already had a certain amount. If each distinct article on the list costs a dollar, they are all supposed to be of equal utility. Their degrees of utility are, in fact, very unequal.

In careful statements of this law, allowance is made for the fact that, as an income grows larger, there is not a continuous quantitative increase in the consumption of all the articles that are early secured. Some articles for consumption are never duplicated at all; and others, which are duplicated, have, after one unit has been supplied, a comparatively slight utility. One watch may be nearly indispensable; while a second would be of very little use. Another correction of the current form of statement of this law is of much more importance. What is the final increment of wealth consumed? It is not complete articles as such at all. It is almost entirely composed of utilities of articles. These can be mentally distinguished from other qualities that compose the entire articles; but they cannot be separated from them. A man's final increment of consumers' wealth consists mainly in certain elementary qualities that help to constitute the articles that he uses. It is a literal fact that one can scarcely find on the dining-table of a rich man a single article that, in its entirety, enters into the final increment of wealth that he consumes; yet some component element of almost everything there found does so. Something in the meat, the prepared vegetables, the pastry, etc., is bought with

the man's final dollars, and constitutes his final increment of food.

In pure theory the statement of the fact should be this: Every article that a man buys for personal use contains a composite of elements, some one of which enters into his final increment of consumers' wealth. What a man does, as his means of increase, is, before anything else, to improve the quality of the articles that he uses. Often he does not add at all to their number; but he causes them to be made of finer material, or to be larger or handsomer. He adds to his wealth for consumption, not new things, but new utilities; and these are mainly attached to things of kinds formerly consumed. As he cannot literally buy a cheap article and afterwards improve it, he buys the improved article at a single purchase. The literal effect of spending his last dollar consists in the substituting of a good article for the cheap one with which he would have contented himself if his available means had been smaller.

Shelter is one of the prime necessities of life; and there is something in the rich man's mansion that satisfies this primary need. His present house may be the last house that he builds, and in that sense the whole of it is final; but, in its entirety, it is not included within the final increment of his consumers' wealth. The element of simple shelter that the building contains represents one of the earliest increments. Some of the dollars that he has spent are paid for shelter, some for comforts and conveniences, and some for the last elegances that the owner adds to his list of consumers' goods. It is these last elements of cost in the dwelling that, in this man's case, constitute final increment of wealth consumed. The same thing is true of simpler articles. As the man sits at his breakfast table, he recognizes, if he thinks, that the very chop on his plate, by virtue of its different utilities, spans the entire range of his consumption from the first incre-

ment to the last. It contains nourishment, which is bought with what is logically the man's first dollar. It also has qualities that are imparted to it at great cost. Skilled and expensive culinary labor has done its best for it; and it would not be precisely what it is if it were not for the last dollars that are expended in securing an accomplished cook. Simple as this article is, it contains, in effect, a composite of qualities some of which enter into the final increment of wealth consumed, while others distribute themselves through the series of increments to the very last. If one can isolate one of these elementary qualities, he can locate it in the series. The chop, as a whole, is bought with a sum of which some part enters into each increment of the "money" that the man spends on his own gratification.

It is clear that what is called a "final" unit of consumers' wealth is not the one secured last in point of time. Even if we were to actually dole out to a man unit by unit the money that he is to spend on himself in a year, and let him try to buy the supplies for the year in the order of their importance, he could not do it. With the first unit of income he would have to buy the cheapest food; and with later increments he would be obliged to transmute that material into that which is of finer quality. Knowing, in fact, the extent of his income, he buys the fine food in one purchase. That which, in logic and not in time, constitutes the first increment of consumers' goods is that economic element, or utility, in goods consumed that in some form would have been secured if the man had had only one unit of income at his disposal. A man does not, with the first unit of his income, build a shanty, and with later units transmute it successively into a house, a mansion, and a palace. He builds the palace as one operation. Somewhere within it there is what, in an economic sense, is equivalent to a shanty. There is in it, before all things else, a power to afford some shelter to its

occupants; and this single utility, merged and lost in the great structure, constitutes an early unit of consumers' goods. Logically, this unit stands near the head of the list, since it precedes most others in importance. In time it accompanies other utilities that stand late in the list. Some quality in the house, and some quality in everything else that the man uses, constitute the logically final increment of his goods for consumption. A mass of utilities, the logically last and finest qualities imparted to articles used for consumption, constitutes the true final increment of the wealth that he consumes. This is an obvious and practical fact; and a somewhat radical amendment of the theory of value is called for by it.

Market valuation is not an individualistic process. The exchange value of a fine article in the market is not fixed by the utility of that article in its entirety to any one purchaser. Only one utility of this article is included in the final increment of wealth consumed by the man who buys it. Other qualities of it enter into the earlier increments of his consumers' wealth. The value of these other qualities to him does not gauge their selling price. The actual law of exchange value is this: the whole article commands in the market a value that is the sum of the values that measure its several utilities. The logically last utility imparted to it—that which gives to it its finest quality, and makes the logically final addition to its cost—is the only part of it that appears in the final increment of consumers' wealth of the man who actually buys this thing. Other utilities in the composite of qualities constituting the article are final in the case of other purchasers. If there are five distinct services rendered by a handsome bookcase, the fifth, or last and least important, is the only one that is final in the case of the man who gets it. There are men whose purchases stop with the fourth. They content themselves with a bookcase having only four utilities of the five represented by this one.

Others stop with the third, etc. Each separate utility in this article of furniture is final in the case of some purchaser. To no one are they all final. The article in its entirety is not in the logically last unit of any one's consumers' wealth. As the article is analyzed, each element in it is, in effect, equivalent to a separate article; and in this way each appears in the final increment of some one's consumption.

It is an actual fact that a fine article of any kind can only get its valuation in the market by an appeal to as many classes of persons as there are grades of that article offered for sale. The men to whom utility number one is final determine the exchange value of that element in the article; and those to whom utility number two is final determine the exchanging rate for that. Each quality in the composite thing gets a market rating by means of the experiences of a distinct set of men. This is a fact that business life will reveal as well as any deduction; and it proves, if nothing else did so, that value is a social phenomenon. Things sell for amounts gauged by their final utilities to society. In the social body, as a whole, every utility in the article is somewhere in the position of a final utility. The shanty that, in effect, is included in the palace is a final utility to some members of society; and it is their valuation that fixes the market rate that that element in the palace commands. We may use the term *value element* to designate a distinct utility, or service-rendering power, imparted to matter by industry. It is not a whole article, but a quality of that article imparted by a distinct expenditure on the part of the maker, and capable of affording a distinct benefit to the user. The scientific fact to be noted in connection with such value elements is that each one separately considered is subject to a law of diminishing utility, and that the diminution is very rapid. A second unit of such an element is worth, as a rule, far less than the first; and a third falls by a still

greater interval below the second. In the case of most men and of most products a fourth unit is seldom purchased at all.* The line that represents the utility curve of any of these elements trends abruptly downward.

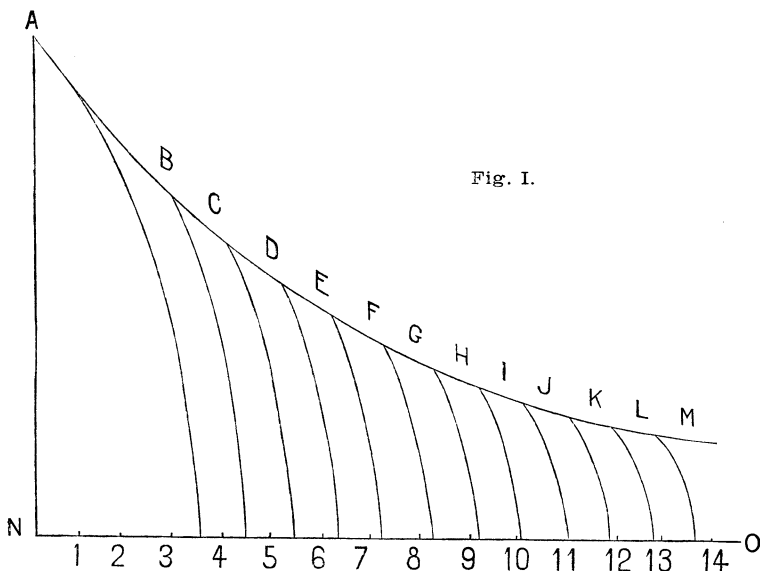


Fig. I.

Let the letters A, B, C, etc., represent different value elements, and let the number of units of each that a man consumes be measured on the line NO. The utility of the first unit of any one is, then, measured by the vertical distance from the letter indicating it to the line NO. The utility of the first increment of A is NA: that of the second unit of A is measured by a line from 1, on the line NO, to that point on the utility curve descending from

* There are homogeneous commodities, such as flour, meat, cloth, etc., of which men buy many units. The utilities embodied in the successive units are not homogeneous. The second measure of flour is designed for a service that is different from that rendered by the first. Except in the case of materials not quite ready for use, the number of such homogeneous articles subject to general increase is not great.

A which is vertically over 1. The utility of the first unit of B is shown by the vertical distance from B to the line NO, etc.

Now, the diminishing utility of general wealth is indicated by the curve AB . . . M. Having freedom to select quite different utilities, as he spends the successive units of his income, the consumer is able to secure a series of articles whose utilities show a gradual decline. B is worth less than A, but it is worth more than a second increment of A. M is worth indefinitely more than a second unit of L. The difference in importance between any two contiguous products is slight. If A, B, C, and D represent the value elements that constitute one article, the diminishing utility of that article in its entirety must be represented by the four lines descending respectively from those letters.

The curve AB . . . M represents the gradual diminution of the utility of "money," or of wealth in indeterminate form, as successive units of it are used for consumption. Not only does the utility curve of general wealth decline less rapidly than that of a single product, but it shows a diminishing rate of descent. When a man is selecting luxuries for consumption, he has a wider range of choice than he has in the selection of necessities. There are many products, or value elements in products, differing little in comparative utility. M on the curve is worth only a little less than L or K. Nearly horizontal is this line of descending utility of general wealth, in its later stages. Comparatively equal and very short are the lines that measure the importance of a unit of it in any form.*

*This diagram may be used to prove that it is important for a man to diversify his consumption. If he has many products to choose from, the specific utility of increasing wealth will diminish less rapidly than it will in the case of a man who has few things to choose from. This point has been presented by Professor Patten with a fulness that leaves nothing to be desired. What I now wish to prove is something different. When the full measure of diversification has been attained, the law of diminishing utility will operate

We may now generalize rapidly. Society is a consumer. We may give general wealth not to one man, but to all men, and its specific utility will decline. Each man will have his utility curve, representing the declining importance of the things that he buys with successive dollars. The dollars last spent* by all-men constitute the final increment of social wealth. They invest themselves in many value elements, and each of these is worth less to the one man who gets it than was any preceding element in his consumption. All the value elements that figure as final are worth less to all-men than were earlier elements. The subjective utility of social wealth is here at a minimum.

If it were possible to buy cheap articles and then improve them, we could isolate the several increments of social consumption, and see what elements compose each one. We could divide the available income of society into tenths, and dole these out to the social body one at a time. With the first tenth each man would get a few things that, from his point of view, are simple and cheap. With a second tenth each man will add some new things to his list of articles consumed, and would improve the old ones. With the third he would add a larger assortment of value elements, since there are now more articles to be improved, as well as a wider range of new articles to be selected. With the tenth fraction of his income each man would get a minute portion of each of a very

rapidly in the case of any one product, and gradually in the case of all products ranged in a series. For more reasons than can here be indicated the basis of the theory of value is the law of varying utility as applied to general wealth. It is, moreover, the consumption of society, and not that of separate individuals, that needs to be taken into account. The study needs to proceed analytically, making distinct utilities, and not articles in their entirety, its subjects. Only thus can the facts that business men perceive and act on be stated in terms of a scientific formula. For a partial statement of this principle see the sixth chapter of "The Philosophy of Wealth," by the writer of this paper.

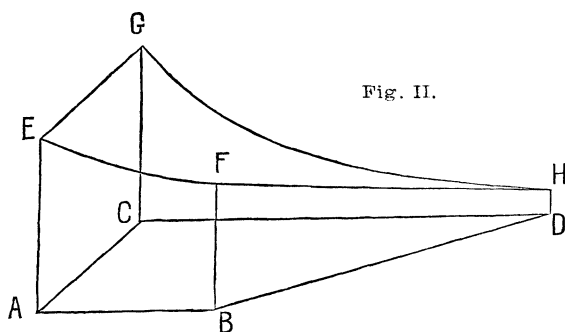
* We have carefully to keep in mind that "last" means logically last, as before indicated, and not latest in point of time.

numerous list of value elements. There would be very many articles on which he would put improvements.

The scientific point to be gained by this imaginary process is the further illustration that it affords of the truth, already stated, that all society acts in determining market values. Many an article has ten distinct component qualities, or value elements. Ten grades are offered for sale. Some men content themselves with the first, and they fix the market value of that grade of the goods. Other men add to the lowest grade one improvement. They fix the selling value of that improvement only. The price of the complete article of grade number two is determined not by either of these classes acting separately, but by both acting together. Each social class fixes, by its demand for some one value element, the price of that element; and it takes them all to give a market rating to the commodity in its completeness. The list of elements that constitute the finest articles bought and sold in the market span the whole range of distinctly social consumption. Each class helps in fixing their values.

If this seems like a refinement of pure theory, it will be easy to see that it is a fact that is acted on by manufacturers. If nine grades of an article are now made, and the question arises whether it will pay to make a grade still finer, one fact to be determined is the amount of the return to be gained by making it. How much will some persons give for the difference in quality between the ninth grade and the tenth? Those who buy the tenth grade will, as a rule, not buy the ninth. Their consumption determines the market value of the proposed improvement only. Poorer men's demand fixes the value of the earlier qualitative elements that enter into the high grade product; and it is the demand of the very poor that begins the operation, and assigns a price to the first value element that enters into it. We saw before that a fine article spans the whole range of a rich man's consump-

tion. One element only is in the final increment of his consumers' wealth; while other elements are in earlier increments, where they have no influence on value. We see now that the different grades of an article of one kind spans the social consumption also, and that it is a matter of practical business knowledge that the different classes in society act together in determining the value of all grades above the lowest.



In the above figure EF is the utility curve of the general wealth used by one man. AB measures the number of products, or value elements, that he gets. He is the poorest man in the society that we are studying, and the utility of the last unit of his income is great, being indicated by the line FB. GH is the utility curve of the richest man in the society. CD measures the amount that he spends, and the short line HD measures the utility of the last unit of it. If we imagine curved lines contiguous to each other, and filling the space between these curves EF and GH, we shall represent the experiences of all members of the society. Each line will be some one's utility curve; and the curved surface EFGH will be the graphic representation of the diminishing utility of the wealth of the society. Vertical lines descending from FH to BD will represent the utility of different persons' final units

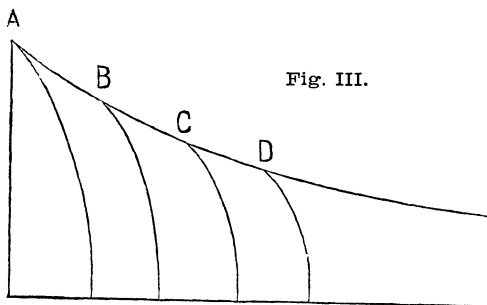
of income; and the area of the vertical surface FBDH will measure the entire utility to society of the last increment of its wealth for consumption. *This is the true unit of value.* The utility to society of the last products, or value elements, that it uses is a quantity. The market value of any article that is produced is gauged by its power to contribute to this quantity.*

The law of varying productivity is the other side of the general law that we have examined. Give to a single worker a single necessary tool, and you add indefinitely to the output of his industry. He can dig many times as much with a shovel as he can with his hands. If you give him a second shovel that is the exact duplicate of the first, you add very little to the result of his digging. There are cases in which several instruments of one kind are useful; but the extent of the service that they render diminishes very rapidly as one after another is supplied. As the utility curve of single products all of one kind is a rapidly decreasing one, so the productivity curve of industrial agents that are all of one kind is one that descends with similar abruptness.

Give to the worker a pick or a crow-bar, instead of a second shovel, and you add much more to his output. Counting the earth that he excavates by the yard, you find that he accomplishes much more with the two unlike tools than he does with one. Give him a series of dissimilar tools, and you continue to increase the fruits of his work; but you do so in a diminishing degree. The productivity of capital of which the forms can vary indefinitely is subject to a law of diminution, as the supply of it increases; but the rate of diminution is far less rapid than it would be if the instruments supplied were all of one kind. If A is a shovel, B a crow-bar, C a pick-axe,

* An entire article, say a pair of fine shoes, will not be found in its integrity in this vertical plane that represents the final unit of wealth; but the value elements that separately constitute a commodity of this kind will all be found there, embodied in different pairs of shoes worn by different persons.

and D a spade, each of these kinds of capital goods, as given to one user, shows an abruptly descending curve of productivity.



The productivity of general capital, as represented by the series, descends along the curve AD. Moreover, as the man adds to the variety of capital goods that he uses, he improves the qualities of all that stand earlier in the series. The first shovel was a stick with a square of iron rudely riveted to it. By the time that a man has a pick-axe he has a better shovel. The good shovel, in its entirety, is not included in the final increment of his capital. Only the quality last imported to it is so included. As, in the study of the law of varying utility, we found that it is indispensable to consider qualities in things as the "value elements" that constitute the final increment of a man's wealth for consumption, so in studying the law of varying production it is necessary to resolve an entire instrument into the producing elements that constitute it. Not entire tools, etc., but only the improvements last made in them enter in to the final increment of wealth for production. The stick-and-plate shovel that, in essence, is merged and lost in the fine steel implement constitutes the part of that fine tool that represents the man's first increment of capital goods; while the difference between the two shovels enters into a later increment. All

workers may have their supplies of tools increased, diversified, and improved. Here a careful adjustment is necessary. We must give to each worker the right amount of new capital, and must put that amount into the right forms. If we give to a shoemaker too many tools or too good ones, and to a weaver tools that are too few or too poor, our new capital is not productive as it should be. By carefully balancing the quantities of capital bestowed on each industry we get the best results. We make an all-around increase of capital, giving to shoemaker, weaver, etc., each his share. The last increment of social capital consists to some extent of instruments; but to a greater extent it consists of new productive powers imparted to earlier instruments.

The last increment of the consumers' wealth of society consists in a miscellany of value elements; and the last unit of social capital consists in a miscellany of producing elements. It is the wealth-creating power of this aggregate that determines the rate of interest. Capital used in transmuting wooden buildings into brick ones, brick buildings into stone ones, and stone buildings into vast modern structures of steel, is a type of that which fixes the rate of interest. It is less productive than was earlier capital in its day. A look over an industrial section shows capital forever increasing by this general and momentous qualitative growth. Wooden bridges are giving place to steel structures, and these to stone arches. Heavier become the railway tracks, cars, and engines. Finer and costlier are the machines in the mills, on the farms, and in the mines. It is the grand aggregate of improvements last made by all society that constitutes the final increment of social capital. The product gained by this all-around improvement and enlargement is the final, or test, product on which the rate of interest depends.

We have said nothing and can say nothing about that action of the same general law that fixes the rate of

wages. Labor also has to be studied as a distinctly social element. It has its final increment, and the product of that increment fixes the rate of wages. On one grand law of variation depend the value of goods, the rate of interest, and the rate of wages. On this depend, in a way that we have not studied, the amount of pure profits and the incentive to social improvement. It is an all-embracing law. It governs individual action and social action; and it is from a study of its influence in the social field that the largest scientific gains are to be made.

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